

Content Outline for Biological Science Section of the MCAT

BIOLOGY

MOLECULAR BIOLOGY: ENZYMES AND METABOLISM

A. Enzyme Structure and Function

1. Function of enzymes in catalyzing biological reactions
2. Reduction of activation energy
3. Substrates and enzyme specificity

B. Control of Enzyme Activity

1. Feedback inhibition
2. Competitive inhibition
3. Noncompetitive inhibition

C. Basic Metabolism

1. Glycolysis (anaerobic and aerobic, substrates and products)
2. Krebs cycle (substrates and products, general features of the pathway)
3. Electron transport chain and oxidative phosphorylation (substrates and products, general features of the pathway)
4. Metabolism of fats and proteins

MOLECULAR BIOLOGY: DNA AND PROTEIN SYNTHESIS

DNA Structure and Function

A. DNA Structure and Function

1. Double-helix structure
2. DNA composition (purine and pyrimidine bases, deoxyribose, phosphate)
3. Base-pairing specificity, concept of complementarity
4. Function in transmission of genetic information

B. DNA Replication

1. Mechanism of replication (separation of strands, specific coupling of free nucleic acids, DNA polymerase, primer required)
2. Semiconservative nature of replication

C. Repair of DNA

1. Repair during replication
2. Repair of mutations

D. Recombinant DNA Techniques

1. Restriction enzymes
2. Hybridization

3. Gene cloning
4. PCR

Protein Synthesis

A. Genetic Code

1. Typical information flow (DNA → RNA → protein)
2. Codon–anticodon relationship, degenerate code
3. Missense and nonsense codons
4. Initiation and termination codons (function, codon sequences)

B. Transcription

1. mRNA composition and structure (RNA nucleotides, 5' cap, poly-A tail)
2. tRNA and rRNA composition and structure (e.g., RNA nucleotides)
3. Mechanism of transcription (RNA polymerase, promoters, primer not required)

C. Translation

1. Roles of mRNA, tRNA, and rRNA; RNA base-pairing specificity
2. Role and structure of ribosomes

MOLECULAR BIOLOGY: EUKARYOTES

A. Eukaryotic Chromosome Organization

1. Chromosomal proteins
2. Telomeres, centromeres

B. Control of Gene Expression in Eukaryotes

1. Transcription regulation
2. DNA binding proteins, transcription factors
3. Cancer as a failure of normal cellular controls, oncogenes, tumor suppressor genes
4. Posttranscriptional control, basic concept of splicing (introns, exons)

MICROBIOLOGY

A. Fungi

1. General characteristics
2. General aspects of life cycle

B. Virus Structure

1. General structural characteristics (nucleic acid and protein, enveloped and nonenveloped)
2. Lack of organelles and nucleus
3. Structural aspects of typical bacteriophage
4. Genomic content (RNA or DNA)
5. Size relative to bacteria and eukaryotic cells